

Course Goals & Grading

Linear Algebra, Math 52, Brown University, Spring 2006, Instructor Stange

You will study the following topics:

This list is subject to slight change as the course evolves.

- solutions of systems of linear equations
- matrices and matrix operations
- solving matrix equations
- linear transformations
- the geometry of \mathbb{R}^n
- vector spaces; basis, dimension, linear independence, subspace
- norms, dot products, geometry of vector spaces
- orthogonality and least squares
- Gram-Schmidt process
- Determinants, cofactor matrix
- eigenvalues and eigenvectors
- applications

You will develop the following skills for interacting with and using this knowledge:

- writing of mathematics and the expression of clear thinking
- logical reasoning using the concepts of hypotheses, conclusions and definitions
- solving problems using established methods
- developing appropriate problem solving methods
- translating applications into mathematical problems to be solved

You will be graded on your knowledge of the topics through the use of these skills.

The basic methods of evaluation are the posing of problems to which solutions must be submitted in written form. These take the forms of timed exams and deadlined homeworks.

Grading on a curve. Since your math professors are fallible human beings, they sometimes set an exam that turns out to return grades which are generally lower, or generally higher, than intended. As a result, I cannot set numerical grade equivalences for letter grades of A/B/C/NC at the beginning of the course. Instead, upon examination of the exam and homework results and other methods of evaluation that may be used, the professor sets the correspondence between number and letter grades. This does NOT mean you are graded on a competitive basis. Instead, you are graded according to your knowledge and skills. The correspondence is set by determining what number grade corresponds to the following criteria for understanding. Your grade depends on you: there will be no surprises, if you read and understand the following criteria.

Criteria for a pass (letter grade of C)

The student...

- has habitual (but not necessarily perfect) accuracy in calculations
- has ability to apply basic methods to standard problems
- does not make false statements in the writeup of solutions
- has knowledge of key definitions and theorems, and the ability to recognize situations in which they apply

Criteria for a letter grade of B

In addition to the above, the student...

- has the ability to make simple deductions based on key definitions and theorems
- shows all the steps in calculation and justifies his/her methods
- has the ability to adapt to small changes in problems (as compared to examples covered in class) by adapting the methods appropriately
- has the ability to recognise a new situation in which known methods apply
- writes generally neat and organised solutions

Criteria for a letter grade of A

In addition to the above, the student...

- has the ability to reason new abstract deductions using definitions and theorems
- has the ability to create new solutions to new problems using established concepts
- has the ability to explain his/her reasoning in a clear and concise manner
- always writes neat, organised, and detailed solutions

How to get the grade you want

As you work on this course, you should pay attention to developing the general skills of visual intuition, comfort with abstract ideas, problem solving skills, and writing skills. These general skills will help you reach the specific skills cited above, that determine your grade. *These skills are all incredibly relevant to "the rest of your life", and are one of the most valuable things you can take from this course.*

Since these skills are subtle and abstract, the best advice is to study examples and work solutions with a consciousness of these things in mind. By asking yourself as you read, "what makes this a well-written logical argument?" or stopping to practice visualising a problem whenever it involves lines and planes, you will gradually develop these. The coursework, lectures and text, are all designed to give you a chance to develop these skills through working with the material of linear algebra. I will do my best to practice these habits aloud in class during lecture, and you should do your best to practice them at home.

Here are some specific suggestions:

- Read critically and actively. Ask “why?” frequently. When the text refers to a previous definition or fact, go back and look it up. Read and follow the guidelines in the handout “How to Read Your Textbook” available on the course website.

- Approach problems with lots of questions. When a problem concerns the application of a theorem, *stop to ask* yourself, “what are the hypotheses?” and check that each is satisfied one-by-one. For every problem you address, *stop to ask*, “What other problems does this remind me of? How is it the same? How is it different? What part of the solutions I already know will apply to this?” Read and follow the guidelines in the handout “How to Do Your Homework” available on the course website.

- Visit the course website for additional resources. An online recommendation is: <http://euler.slu.edu/Dept/SuccessinMath.html>. (Note that of the types of problems listed under “Problem Solving” as 1-5, we are expected to tackle all five in this class.) For something more indepth, try G. Polya’s book *How to Solve It*.